EPA
United States
Environmental Protection
Agency

Petroleum Refinery Fenceline Monitoring Summary

Refining and Chemicals Group, OAR/OAQPS/SPPD
Created by: Alyssa Zimmerman

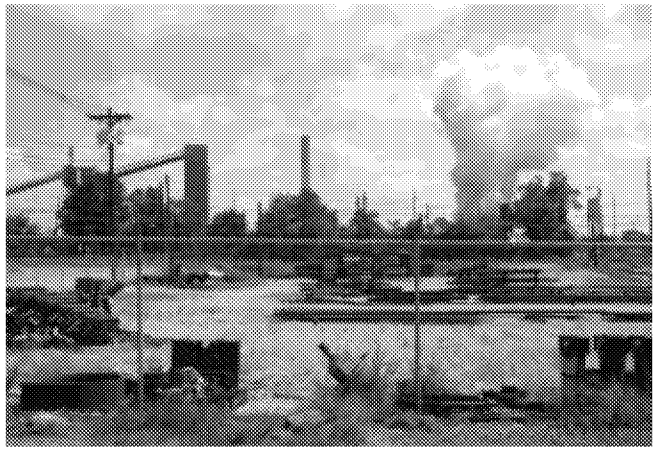
07/25/2019

0

EPA United States Environmental Protection Agency

Overview

- Fenceline Monitoring Requirements
- Goals of this Rule
- Data Summary
- Case Studies
- Future of Fenceline Monitoring



EPA United States Environmental Protection Agency

Rule Overview

- Petroleum Refinery MACT standard (40 CFR part 63 subpart CC) required…
  - All petroleum refineries to monitor benzene emissions along fenceline
  - Report measurement results back to the EPA
    - Raw sampler data
    - Bi-weekly ΔC (highest – lowest concentration)
    - Annual average ΔC
  - Perform root cause analysis and corrective action if rolling annual average ΔC exceeded the benzene action level

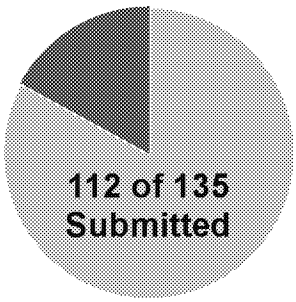
EPA United States Environmental Protection Agency

Why Benzene & Fenceline Monitoring?

- Benzene is found in nearly all refining processes
  - Can lead to negative health effects and increased risk of cancer
- Better manage fugitive emissions from petroleum refineries
  - Reduce public exposure
- Provide verification of our modeling, risk assessments and emission inventories

EPA United States Environmental Protection Agency

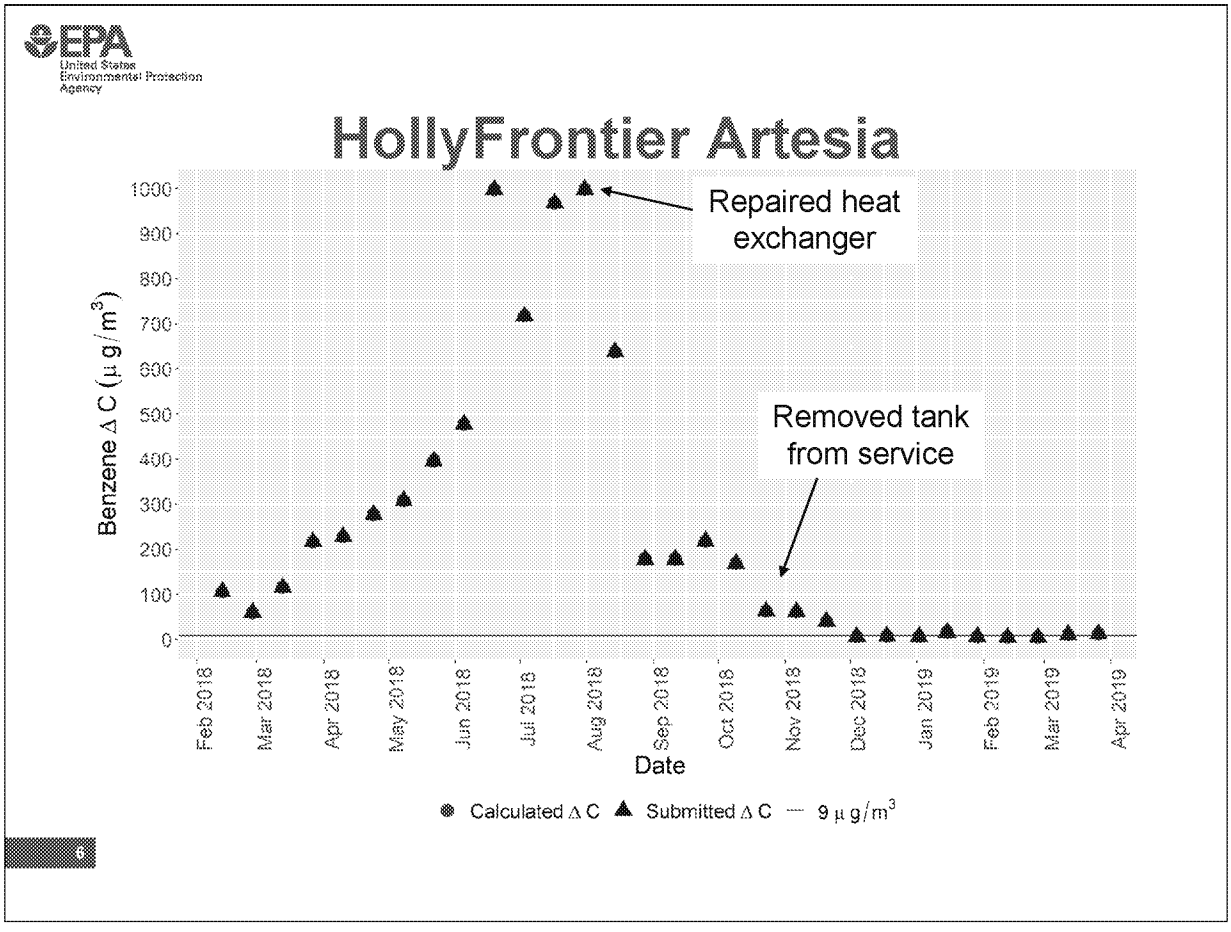
Data Summary

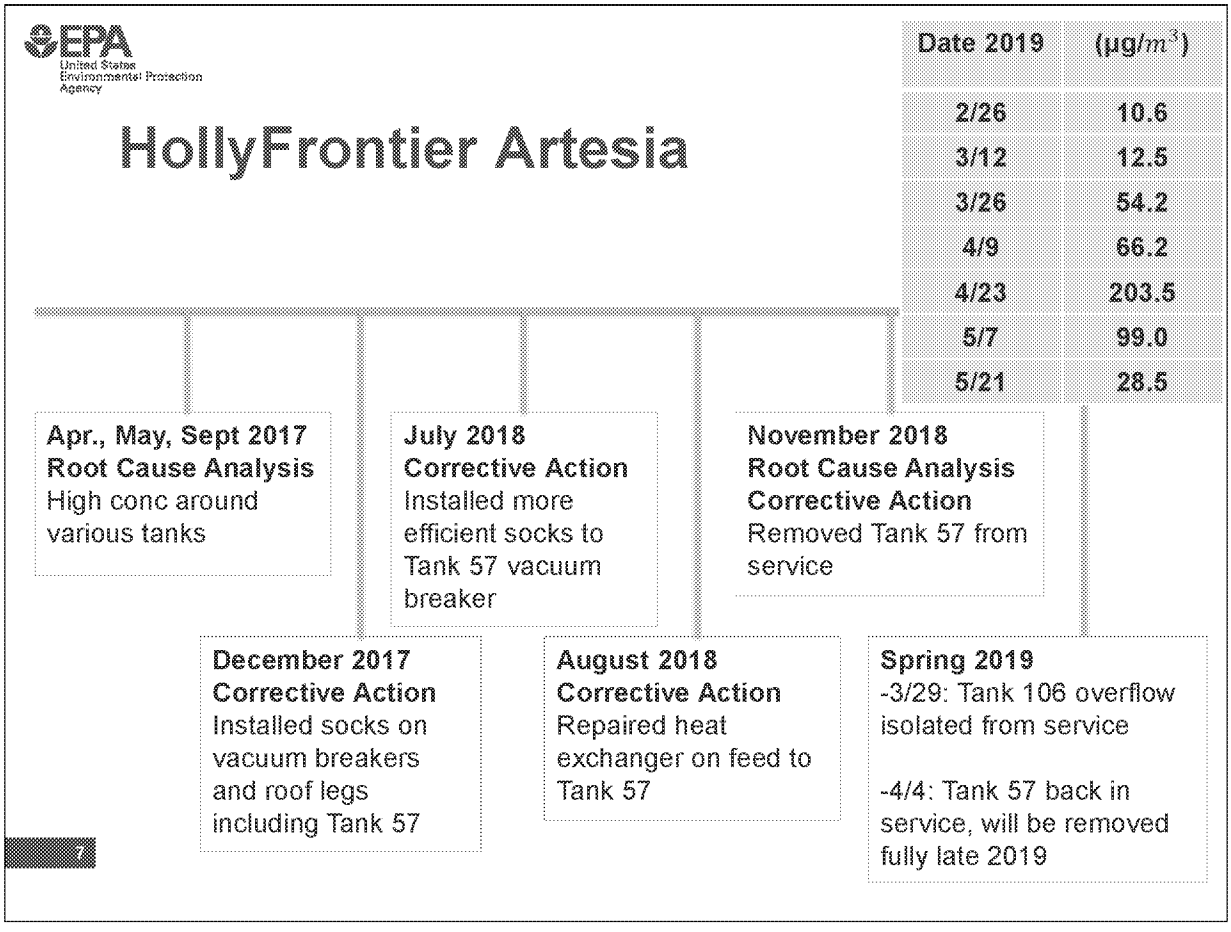


Refinery	State	Maximum Annual Average ($\mu g/m^3$)
HollyFrontier – Artesia	NM	290
Total Petrochemicals USA	TX	23.16
Valero Corpus Christi East	TX	22
Philadelphia Energy Solutions	PA	18
Shell Oil Company- Deer Park	TX	16.11
Chalmette Refining LLC	LA	15
Flint Hills Corpus Christi East	TX	15
Pasadena Refining Systems	TX	14
Valero Corpus Christi West	TX	12
Chevron Pascagoula	MS	11.10
Shell Norco Complex	LA	10.18
Marathon Galveston Bay	TX	9.70

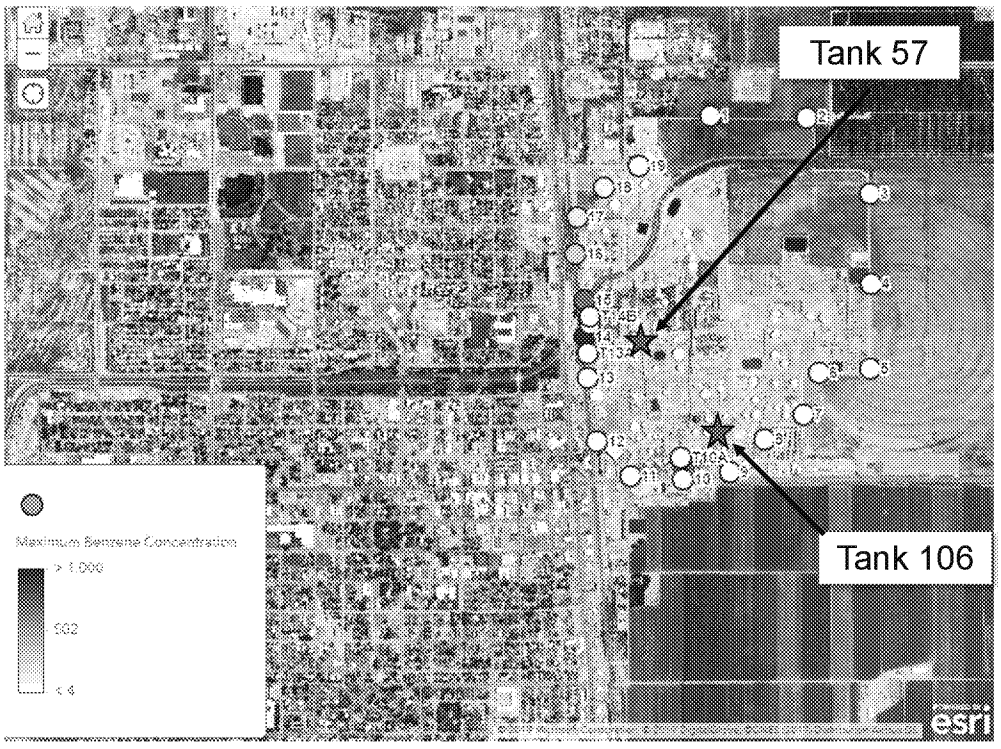
Case Studies

Refinery	Submitted Maximum Annual Avg ΔC ($\mu g/m^3$)	RTR Fenceline Model Prediction ($\mu g/m^3$)	RTR Model Predicted Cancer Risk at MIR due to Benzene (in a million)
HollyFrontier- Artesia	290	1.6	10.60
Philadelphia Energy Solutions	18	1.6	11.33
Marathon Galveston Bay	9.7	0.7	6.02
Shell Norco Complex	10.18	9.3	7.83


EPA
United States Environmental Protection Agency
HollyFrontier Artesia
Repaired heat exchanger
Removed tank from service
Benzene Δ C (μ g/m3)
1000
900
800
700
600
500
400
300
200
100
0
Feb 2018
Mar 2018
Apr 2018
May 2018
Jun 2018
Jul 2018
Aug 2018
Sep 2018
Oct 2018
Nov 2018
Dec 2018
Jan 2019
Feb 2019
Mar 2019
Apr 2019
Date
Calculated Δ C
Submitted Δ C
9 μ g/m3


EPA
United States Environmental Protection Agency
HollyFrontier Artesia
Date 2019
(µg/m3)
2/26
10.6
3/12
12.5
3/26
54.2
4/9
66.2
4/23
203.5
5/7
99.0
5/21
28.5
Apr., May, Sept 2017
Root Cause Analysis
High conc around various tanks
July 2018
Corrective Action
Installed more efficient socks to Tank 57 vacuum breaker
November 2018
Root Cause Analysis
Corrective Action
Removed Tank 57 from service
December 2017
Corrective Action
Installed socks on vacuum breakers and roof legs including Tank 57
August 2018
Corrective Action
Repaired heat exchanger on feed to Tank 57
Spring 2019
-3/29: Tank 106 overflow isolated from service
-4/4: Tank 57 back in service, will be removed fully late 2019
7

HollyFrontier Artesia



8

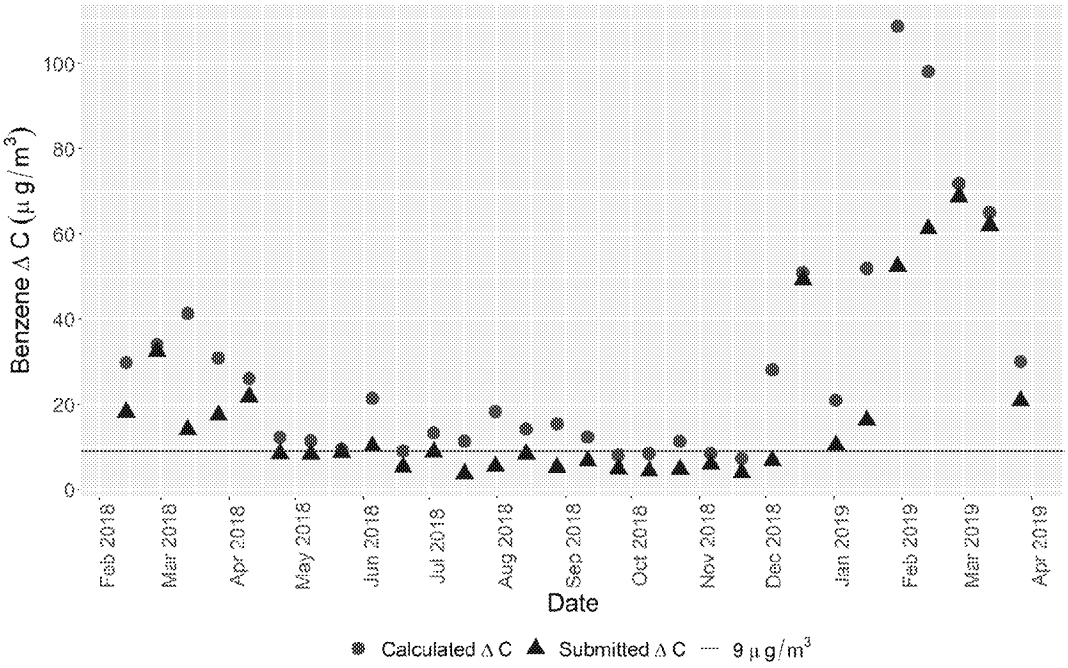
EPA United States Environmental Protection Agency

Philadelphia Energy Solutions

- Submitted an SSMP to correct data due to off-site sources
  - No samplers surrounding an on-site tank farm
  - Issues with modeling
  - Corrected 100% of data
    - On-site sources not subject to MACT
    - An “oil sheen” on the river
- EPA did not issue SSMP
- Large fire in June and announced they are closing the refinery

EPA United States Environmental Protection Agency

Philadelphia Energy Solutions

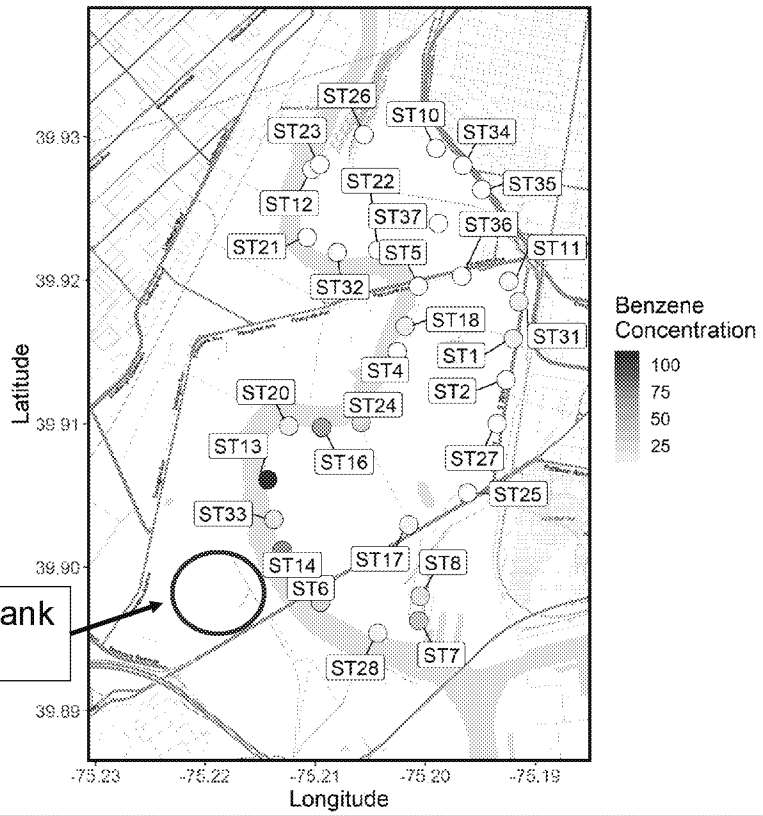


10

10

EPA United States Environmental Protection Agency

Philadelphia Energy Solutions



11

EPA United States Environmental Protection Agency

Marathon Galveston Bay

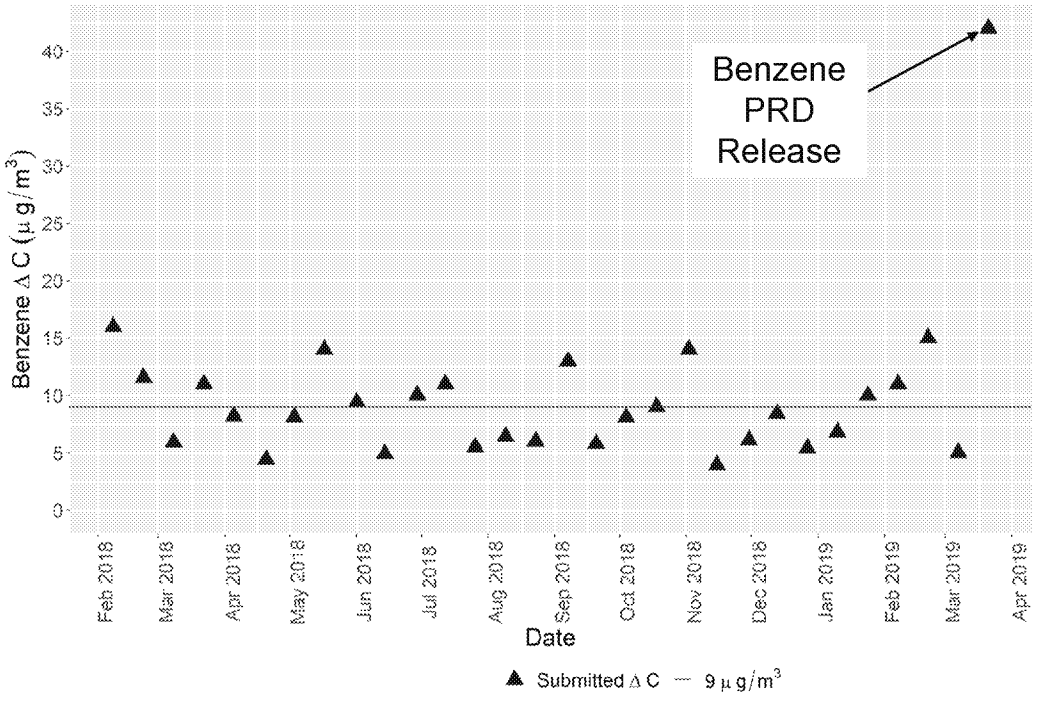
- One of the largest petroleum refiners in U.S.
  - 585,000 barrels per day[1]
- Proactive throughout SSMP process
- Benzene release during April 2019 pushed annual average over 9 µg/m^3
  - Caused by pressure safety valve opened on vapor return line while loading benzene onto a barge
  - Measured 2-week ΔC of 43 µg/m^3

12

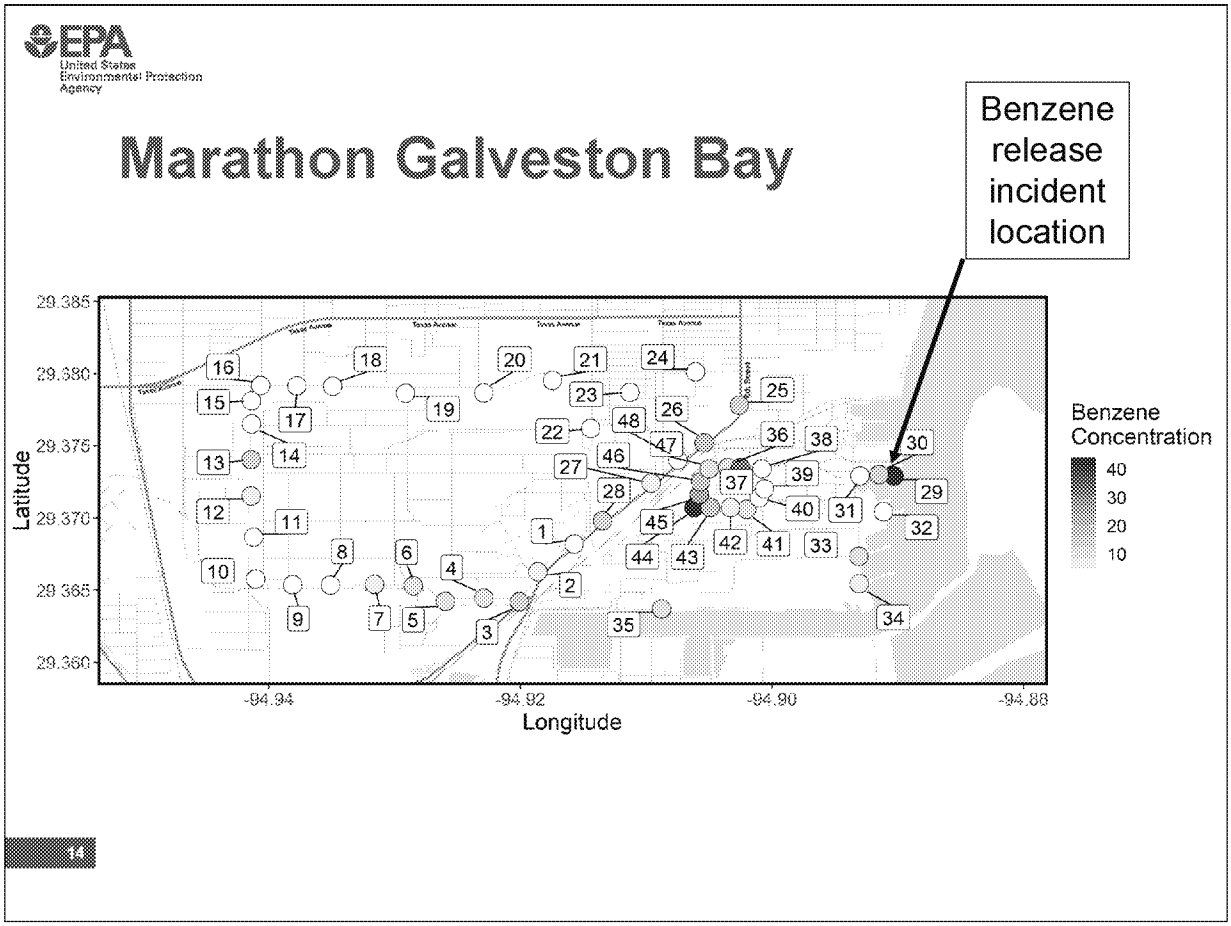
1. https://www.marathonpetroleum.com/Operations/Refining/Galveston-Refinery/

EPA United States Environmental Protection Agency

Marathon Galveston Bay



13


EPA
United States
Environmental Protection
Agency
Marathon Galveston Bay
Benzene release incident location
Latitude
29.385
29.380
29.375
29.370
29.365
29.360
-94.94
-94.92
-94.90
-94.88
Longitude
Benzene Concentration
40
30
20
10
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48

EPA United States Environmental Protection Agency

Future of Fenceline Monitoring

- Successfully acted as a self-directed performance standard for refineries, so what's next...
  - Address initial implementation issues for future quarterly submissions
  - Continue working with industry to ensure the rule remains attainable
  - Update our modeling and emission inventories
  - Quantify emission reductions as a result of this rule
  - Provide quarterly data summaries to enforcement officials
  - Using this methodology for other area sources

15